

The UK Primary Mathematics Challenge

Peter Bailey

“They didn’t fool me with that one!”

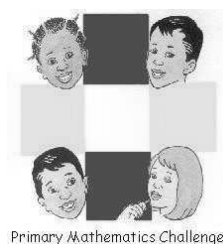
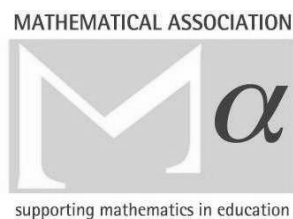


Peter Bailey is a retired secondary mathematics teacher who has been involved in The Mathematical Association for many years, as chair of the Publications Committee and, for the last six years, as chair of the Primary Mathematics Challenge teams.

1 Background

Back in 1999, secondary pupils in the UK had the opportunity to take part in mathematics challenges organised by the United Kingdom Mathematics Trust (UKMT). These are well organised and popular. But there was no similar challenge for primary pupils. So The Mathematical Association decided to set up the Primary Mathematics Challenge (PMC).

The structure of the PMC is based on ideas from Dr Tony Gardiner. The planning group wanted to set a challenge for as many primary (aged 10 and 11) pupils as possible, which was fun, motivating and mathematical. We also wanted it to feed pupils into the Junior Mathematics Challenge run by the UKMT for junior secondary pupils.



2 The Structure of the PMC

The PMC is aimed at the top 60% of pupils in the final two years of primary school in England and equivalent ages in Scotland, Wales and Northern Ireland. Teachers can give the PMC to their pupils at any time during November. It has 25 multiple-choice problems which are interesting to these pupils and are mathematical. The first 10 are easy, the next 10 a little harder and the last five harder still. Correct answers for problems 1–20 score one mark each; correct answers to problems 21–25 score two marks each. The idea is that the majority of pupils achieve at least 15 marks but that there is differentiation among the top marks.

The 25 problems are on mathematical material which the majority of pupils will have covered in lessons. It is not the intention to set problems on secondary topics but rather to set problems on primary topics which can lead to discovery and further work at this level. Some problems have funny names and are set in amusing situations. Highest-scoring pupils are invited to take the PMC Finals the following February.

The central aim in planning the administration of the PMC is to make it as easy as possible for the teachers! PMC papers are sold in packs of ten, with seven certificates provided in each pack (1 gold, 2 silver, 3 bronze and one photocopiable 'Took the Challenge' certificate). Teachers mark the pupils' responses themselves, using the easy-to-use mark sheet. The certificates are awarded in-school by the teacher who decides who gets what! Teachers also receive an Answers and Notes sheet which provides some discussion on problem-solving methods for the 25 problems, and ideas for further activity in classrooms following the Challenge.

Feedback Sheets for pupil and teacher comments are provided; teachers can also fill in and return the Tally Form which asks for the mark distribution so that the PMC Problems Team finds out how pupils have managed on their paper. The names of the highest-scoring pupils and their marks are also sent to the PMC office, so that invitations to take the PMC Finals can be made.


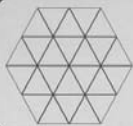








With most pupils scoring at least 15/30 on the PMC in November, there will be some pupils (the best young mathematicians in the UK) who have all scored very high marks. They are invited to take the PMC Finals in the following February. The structure of the Finals is the same as the November PMC with 25 multiple-choice problems, but the problems, still on primary mathematics topics, are more difficult. Pupils' Answer Sheets for the Finals are marked by the PMC office; certificates and medals are awarded by The Mathematical Association and sent to schools in March.

3 Growth in the PMC

The number of schools and pupils has grown rapidly each year. A grant from the Nuffield Foundation provided money to get the challenge started. Here are the figures:

	No of schools	Schools in					PMC papers sold
		En	Sc	Wa	NI	Other	
1999	311	240	14	12	43		10930
2000	780	626	44	34	72		32010
2001	1175	936	62	98	77		45060
2002	1598	1398	83	40	73		62000
2003	2615	2277	144	85	100	9	88300
2004	3179	2790	148	86	105	50	110880

4 A few PMC problems

November 2003	February 2004
<p>Vicky Vosene is planning to have a bath. Suppose V = get out of the bath, W = wash myself, X = get in the bath, Y = put the water in, and Z = dry myself. Which is the correct order for a successful bath?</p> <p>A VWXYZ B ZYXWV C WZXVY D YXWZV E YXWVZ</p> 	<p>How many regular hexagons are in this diagram?</p> <p>A 1 B 4 C 7 D 8 E 12</p> 
<p>Which of these solid shapes will not tessellate in three dimensions?</p> <p>A  B  C  D  E </p>	<p>Cindi has strands of beads in her hair. Half the strands have 2 beads, and half have 3 beads. If she has 90 beads, how many strands are in her hair?</p> <p>A 15 B 18 C 36 D 45 E 90</p> 
<p>Freda fries four fish in five minutes, and Fred fries five fish in four minutes. How many fish are fried if they both fry for twenty minutes?</p> <p>A 9 B 20 C 40 D 41 E 50</p> 	<p>The diagram shows a square with a right-angled isosceles triangle on one side. The area of the triangle is 16cm^2. What is the perimeter of the square in cm?</p> <p>A 4 B 8 C 16 D 32 E 64</p> 

5 Feedback from schools

The PMC office asks for and receives lots of feedback each year. Here are a few of the comments sent in to the office:

Comments from pupils

I liked the funny names
 I can't believe I got a silver
 I didn't panic—I just got on and did it
 Tricky but interesting
 Best test I've ever done
 It really made me think
 I enjoyed getting my certificate
 I thought of pizzas when solving no 20
 In the end I just guessed
 It wasn't hard but it was tricky
 They didn't fool me with that one
 It got tricky after the double lines

At first I thought oh no! but when I got into it I was quite excited

Comments from teachers

It got all pupils thinking
Super—easy to mark
Nice to raise the profile of maths in school
Good range of problems
All pupils could participate
Thank you for the follow-up suggestions
Great for thinking skills
Fair but challenging
Good ideas for follow-up
Found some gaps in my teaching
Generated a lot of discussion
Parents seem keen on the PMC too
The award winners were really proud of their certificates



6 Some difficulties

Not all feedback is positive. Teachers send in helpful comments about the problems and how the administration can be improved. There are always some aspects of the PMC which give the organisers food for thought. Here are a few.

- The PMC is meant to be a positive experience for all pupils, with the large majority scoring more than 15/20. The Problems Team constantly finds it difficult to provide interesting non-trivial mathematical problems which the majority of pupils can get correct!
- Many of the problems are set in real-life amusing situations. It is not easy to keep the reading age of the contexts at a reasonable level. We aim for a reading age of nine. But some comments from teachers have suggested the paper has challenged literacy rather than mathematics!
- It is not easy to provide the correct number of certificates for schools' needs. Teachers themselves award the certificates. Sometimes the certificates which they receive in the packs does not allow them to give awards as they would wish. Allowing schools to phone for more would be expensive in office time.
- The PMC Finals is provided for those pupils who score the highest marks in the November PMC. The best young mathematicians in the country are now taking the Finals. We want to avoid the PMC feeling like a government test! In the first few years, finalists could take the Finals on any day within a two-week period. The dilemma is that, whilst the PMC should be fun, the pressure is on to make sure that there are no irregularities in pupil's responses. For the first time (2005) teachers have to set the PMC Finals on a specified day in February.

7 For the future

In the coming years the Management Team will be aiming to:

- further increase the number of pupils taking the PMC each year, possibly by working with an education company to assist in promotion and sales
- provide challenge papers in which the majority of pupils score 50% or more, and which give pupils a positive mathematical experience!
- keep the PMC lively and unlike government assessment.

For further information on the Primary Mathematics Challenge, please contact the PMC office at The Mathematical Association, 259 London Road, Leicester LE2 3BE, phone 0116 221 0013, fax 0116 212 2835, email pmc@m-a.org.uk or the website www.m-a.org.uk .

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